

## Radiation Report on **AD744TH (DC: 0000G)**

Project: AIM

A radiation evaluation was performed on **The AD744TH 500 ns Settling BiFET Op Amp (Analog Devices)** to determine the total dose tolerance of these parts. The total dose testing was performed using a  $\text{Co}^{60}$  gamma ray source. During the radiation testing, four were irradiated under bias, see figure 1. One part was used as a control sample. The total dose radiation levels were 1, 5, 10, 15, and 20kRads(Si). The average dose rate was 42.64 rads(Si)/min. After the 20krad(Si) irradiation, the parts were annealed under bias at 25°C for 168 hours. After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits listed in Table III. An executive summary of the test results is provided below in bold, followed by a detailed summary of the test results after each radiation level and annealing step.

**After the 10krad(Si) radiation step all devices exceeded the manufacturer's specified 100pA datasheet limit of positive bias current by an average of 5.4pA. The devices continued to degrade at the 15krad(Si) & 20krad(Si) radiation steps, exceeded the specified maximum by 25.00pA and 53.90pA. After a 168-hour biased room temperature anneal, the devices still exceeded the specification limit by 39.9 pA.**

Initial electrical measurements were made on 5 samples. Four samples were irradiated (1, 2, 3, 4)) and device number C was used as a control sample. All devices had the following external markings on the package: AD744TH 883B Q 0000G

All parts passed all parametric tests up to and including 5krad(Si)

At 10krad(Si) all devices exceeded the manufacturer's specified 100pA datasheet limit of positive bias current by an average of 5.4pA

At the 15krad(Si) and 20krad(Si) radiation steps the degradation continued, all devices exceeded the datasheet maximum by 24.98pA and 53.94pA. of positive bias current

The devices recovered slightly after a 168-hour biased room temperature anneal, but exceeded the specified maximum by of positive bias current 39.88pA.

Table III provides a summary of the test results with the mean and standard deviation values for each parameter after each irradiation exposure and annealing step.

TABLE I. Part Information

<b>Generic Part Number:</b>	AD744
<b>Full Part Number</b>	AD744TH/883B
<b>Manufacturer:</b>	Analog Devices
<b>Lot Date Code (LDC):</b>	0000G
<b>Quantity Tested:</b>	5
<b>Serial Numbers of Control Sample:</b>	C
<b>Serial Numbers of Radiation Samples:</b>	1, 2, 3, 4
<b>Part Function:</b>	OPAMP
<b>Part Technology:</b>	BiFET
<b>Package Style:</b>	8-pin dip
<b>Test Equipment:</b>	HP4156B Precision Semiconductor Parameter Analyzer; HP E3611A DC Power Supply
<b>Test Engineer:</b>	C. Palor / A. Pham

- The manufacturer for this part guaranteed no radiation tolerance/hardness.

TABLE II. Radiation Schedule for AD744

EVENT	DATE
1) INITIAL ELECTRICAL MEASUREMENTS .....	02-25-2005
2) 1 KRAD IRRADIATION (12.8 RADS (Si)/MIN) .....	03-01-2005
POST-1 KRAD ELECTRICAL MEASUREMENT .....	03-01-2005
3) 5 KRAD IRRADIATION (4.0 RADS (Si)/MIN) .....	03-01-2005
POST-5 KRAD ELECTRICAL MEASUREMENT .....	03-01-2005
4) 10 KRAD IRRADIATION (95.75 RADS (Si)/MIN) .....	03/01/2005
POST-10 KRAD ELECTRICAL MEASUREMENT .....	03/02/2005
5) 15 KRAD IRRADIATION (95.75 RADS (Si)/MIN) .....	03/02/2005
POST-15 KRAD ELECTRICAL MEASUREMENT .....	03/02/2005
6) 20 KRAD IRRADIATION (4.9 RADS (Si)/MIN) .....	03/02/2005
POST-20 KRAD ELECTRICAL MEASUREMENT .....	03/10/20058

Average Dose Rate = 42.64 rads (Si)/min

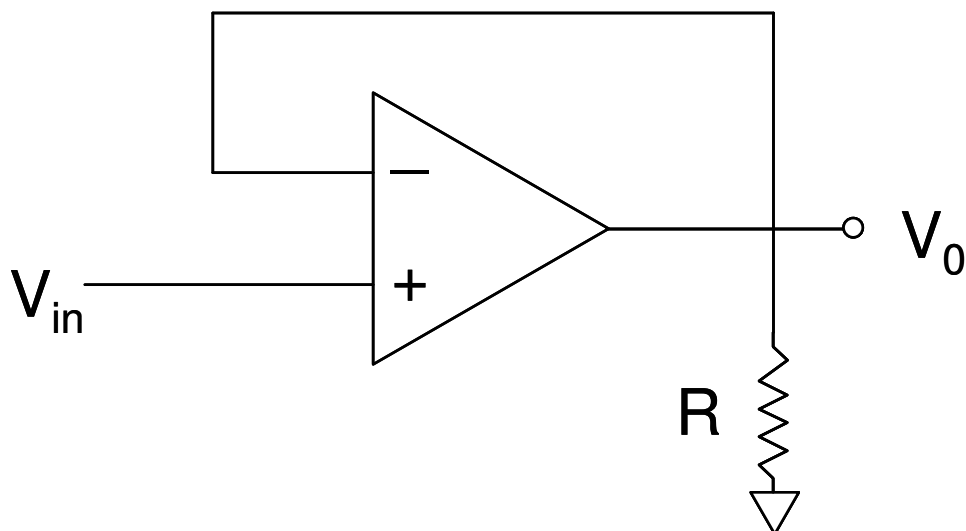


Figure 1. AD744 Bias Circuit

Table III. Electrical Characteristics AD744

Test #	Total Dose Exposure																Annealing		
	Spec. Lim. (2)					Initial		1kRads (Si)		5kRads (Si)		10kRads (Si)		15kRads (Si)		20kRads (Si)		168 hours @25°C	
	Paramete	condition	Units	min	max	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
1	+IB	Vs = ±15 V dc, Ta = +25 C	pA	--	100.00	40.86	22.92	44.55	19.42	57.67	2.76	105.40	2.66	124.98	34.29	153.94	41.81	139.88	3.87E-11
2	-IB	Vs = ±15 V dc, Ta = +25 C	pA	--	100.00	36.32	20.34	44.01	17.14	55.61	4.61	102.32	4.21	119.41	34.55	148.66	42.16	118.25	3.92E-11
3	I <sub>io</sub>	Vs = ±15	pA	--	50.00	4.54	2.74	2.62	3.73	2.05	1.97	3.08	2.40	3.08	2.40	5.05	2.52	4.62	7.78E-13
4	V <sub>IO</sub>	Vs = ±15	mV	--	0.50	-0.09	0.18	-0.25	0.25	0.29	0.38	-0.55	0.30	0.13	0.39	-0.63	0.58	-1.07	7.01E-04
5	V <sub>SWING</sub>	Vs = ±15V, TA =25deg C	V	± 12	--	±14.09	1.47E-03	±14.08	1.41E+01	±14.09	1.47E-03	±14.09	5.68E-03	±14.08	2.46E-03	±14.08	5.77E-04	±14.09	2.45E-03